



Original Article

Convergent validity of the Child Behavior Checklist sleep items with validated sleep measures and sleep disorder diagnoses in children and adolescents referred to a sleep disorders center



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ABSTRACT

Objective: The Child Behavior Checklist (CBCL) is a commonly used measure of child and adolescent functioning, and a handful of items from the CBCL are often used to measure sleep functioning. The objective of this study was to examine the convergent, discriminant, and external validity of the individual CBCL sleep items and a CBCL sleep composite with validated measures of sleep functioning and youth adjustment as well as sleep disorder diagnoses.

Methods: The participants were 383 youths (ages 6–18 years; 52.5% male; 80% non-Hispanic White) evaluated in a behavioral sleep medicine clinic. A sleep psychologist diagnosed sleep disorders following a comprehensive evaluation. Parents completed the CBCL in addition to the Children's Sleep Habits Questionnaire (CSHQ) and the Sleep Disorders Inventory for Students (SDIS). Adolescents completed the Adolescent Sleep–Wake Scale (ASWS).

Results: Individual CBCL sleep items were generally associated with sleep scales on validated sleep measures and with sleep disorder diagnoses. The CBCL sleep composite was associated with total scores on each of the sleep-specific measures, as well as with the CBCL attention, social, internalizing, and externalizing problems scales.

Conclusions: Although the CBCL is inadequate for thoroughly assessing sleep problems and disorders, sleep items on the CBCL may be useful in epidemiological/archival studies that lack a more comprehensive sleep measure or to clinicians who do not use other validated sleep measures in their typical practice. Individual CBCL sleep items may be optimal when assessing specific facets of sleep functioning whereas the CBCL sleep composite may be optimal when examining overall sleep functioning and external correlates of sleep.

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1. Introduction

The *Child Behavior Checklist for Ages 6–18* (CBCL) [1] is a widely used measure to assess the mental health and social functioning of children and adolescents. For example, the CBCL is the most commonly used measure of psychopathology utilized by pediatric psychologists [2]. Although the CBCL includes multiple items that assess aspects of sleep, these items do not form a validated

specific sleep functioning scale on the CBCL. The seven items related to sleep are as follows: “nightmares” (Item 47), “overtired without good reason” (Item 54), “sleeps less than most kids” (Item 76), “sleeps more than most kids during day and/or night” (Item 77), “talks or walks in sleep” (Item 92), “trouble sleeping” (Item 100), and “wets the bed” (Item 108). Nonetheless, multiple studies have used these items to create a measure of sleep functioning (using either all seven items or all items except the “wets the bed” item) [3–5]. For instance, sleep items on the CBCL have been used to demonstrate sleep problems among children with anxiety [6], severe traumatic brain injury [7], seizures [8], and Tourette's syndrome and chronic tic disorder [9]. In addition, CBCL sleep items measured in childhood (and the “sleeps less than most kids” item in particular) have also been shown to longitudinally predict anxiety/depression and aggression in adolescence [10] and young adulthood [11].

The literature also indicates that the CBCL sleep items are more frequently endorsed among clinically distressed youths or youths experiencing sleep complaints in comparison to healthy control

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children. Specifically, Alfano et al. [6] examined the prevalence of CBCL sleep complaints in 35 anxious youths, 33 youths referred for sleep problems, and 38 healthy control youths. In this study, a sleep complaint was defined as at least one CBCL item being scored as occurring “sometimes” (a score of 1) or “often” (a score of 2). A sleep complaint was endorsed as present for 94% of the sleep-referred youths and 82% of the anxious youths in comparison to 29% of the control participants.

Despite these findings using the CBCL sleep items (either individually or together to form a “sleep problems” composite scale), very little empirical research has evaluated whether the CBCL sleep items correspond with other, validated measures of children’s sleep functioning. We are aware of only one study that has specifically examined the CBCL sleep items in relation to sleep measures commonly used in clinical sleep medicine practice, including sleep diaries, actigraphy, and polysomnography (PSG) [3]. Specifically, Gregory and colleagues [3] examined four CBCL sleep-related items (ie, overtired, sleeps less than other kids, sleeps more than other kids, and trouble sleeping) in a sample of 122 youths (ages 7–17) with an anxiety and/or depressive disorder or no psychiatric history. The authors found that, after controlling for age, gender, and psychiatric diagnostic status, the CBCL “trouble sleeping” item was significantly associated with sleep latency as assessed by both participants’ sleep diary and actigraphy ($r = 0.25$ and 0.21 , respectively). The CBCL “overtired” item was also positively correlated with the sleep diary sleep latency variable ($r = 0.19$) and the “sleeps more than other kids” item was negatively correlated with the actigraphy sleep latency variable ($r = -0.21$). Finally, the CBCL “sleeps more than other kids” item was negatively associated with the sleep diary ease of waking variable ($r = -0.25$), the “sleeps less than other kids” item was negatively associated with total sleep time as measured by the PSG electroencephalography (EEG) ($r = -0.23$), and the “overtired” item was (unexpectedly) negatively associated with the number of arousals as measured by the PSG EEG ($r = -0.22$). Other hypothesized associations were not significant, leading the authors [3] to conclude that “the CBCL is clearly not the measure of choice to assess sleep, [although] the correspondence between the CBCL sleep items and other measures of sleep lends preliminary support to the notion that the CBCL may be tapping certain aspects of sleep. . . the CBCL may be most useful as a measure of sleep onset problems.” [3].

The aim of the present study was to expand upon the study by Gregory et al. [3] in order to further examine the clinical utility of the CBCL sleep-related items. First, Gregory and colleagues focused on four of the seven CBCL sleep items, noting that it was unclear how the “nightmares” or “talks or walks in sleep” items would correspond to the sleep diary, actigraphy, or EEG measurement used in their study. It therefore remains unclear if these items (as well as the “wets the bed” item) meaningfully relate to other measures of sleep functioning (and, specifically, parasomnias). Second, and relatedly, Gregory and colleagues focused on four individual sleep items and did not create a “sleep problems” composite score from the CBCL items as has been used in previous research. It would be helpful for researchers or clinicians interested in using the CBCL sleep items to know whether individual sleep items or a composite sleep scale is more strongly associated with other measures of sleep functioning. Third, Gregory et al. examined the CBCL sleep items in relation to three measures of sleep (ie, sleep diary, actigraphy, and PSG). Although these measures are often considered to be optimal self-report and objective measures of sleep, they are more time- and cost-intensive than rating scales, can lack specificity if clearly defined operational definitions are not utilized, and are typically only used in sleep-specific clinics and research studies. In addition, subjective and objective measures of sleep often do not correlate strongly with each other [11–13], in part because they “target different constructs and should not be considered as merely different operational definitions.” [14] It is thus reasonable to expect that the CBCL sleep

items would more closely correspond with other parent-report measures of sleep functioning than with self-report sleep diaries or objective actigraphy/PSG measures. This is especially true as parent-report measures are generally expected to correlate more strongly with other parent-report measures as opposed to correlating with objective measures or with measures completed by other informants (e.g., youth self-report and teachers). Finally, Gregory et al. [3] used a sample of youths with or without an anxiety/depressive disorder, and we sought to extend the literature by examining the CBCL sleep items (and their composite score) in relation to self- and parent-report measures of sleep functioning in a sample of children and adolescents seen within a specialty sleep clinic within a pediatric medical center.

2. Methods

2.1. Participants

The sample included 383 youths of ages 6–18 years ($M = 11.32$, standard deviation (SD) = 3.68) and their caregiver(s). The sample was approximately equally split between boys ($n = 201$; 52.5%) and girls ($n = 182$; 47.5%). The majority of children were non-Hispanic White (80%), with remaining participants being African American (9%), Asian/Asian American (2%), Hispanic (2%), or Multiracial/Other (7%). In terms of parents’ marital status, 64% were married, 14% were unmarried, 14% were divorced, 4% were separated, 3% were remarried, and 1% were widowed. The annual income of families was approximately evenly split across four levels: 23% reported an annual income <\$20,000 USD, 24% reported an annual income of \$20,000–49,000 USD, 25% reported an annual income of \$50,000–99,000 USD, and 29% reported an annual income >\$100,000 USD.

Patients were diagnosed with sleep disorders according to *International Classification of Sleep Disorders Diagnostic and Coding Manual, 2nd Edition* (ICSD-2) [15] criteria. Specifically, 176 participants (46%) were diagnosed with psychophysiological insomnia, 155 participants (40%) were diagnosed with a behavioral insomnia of childhood (sleep-onset association type, limit-setting type, or combined type), 88 participants (23%) were diagnosed with a parasomnia such as nightmares, sleepwalking, and/or sleep terrors, 42 participants (11%) were diagnosed with delayed sleep phase syndrome (DSPS), 19 participants (5%) were diagnosed with nocturnal enuresis, 11 participants (3%) were diagnosed with hypersomnia (narcolepsy and/or idiopathic hypersomnia), and four participants (1%) were diagnosed with rhythmic movement disorder. Two-thirds of participants ($n = 251$) had a sleep disorder diagnosis in only one of these seven categories, 30% of participants ($n = 116$) met criteria for a sleep disorder in ≥ 2 of these categories, and 4% ($n = 16$) were evaluated for sleep-related difficulties but did not meet the full criteria for any ICSD-2 sleep disorder.

2.2. Procedures

The study site was a pulmonary-based, accredited sleep disorders center (SDC) located in a tertiary-care pediatric hospital and staffed by board-certified sleep physicians and a licensed psychologist certified in behavioral sleep medicine. Patients referred to the SDC were triaged based on referral question and parent-reported history gathered during an intake telephone interview. Patients with a chief complaint of insomnia, parasomnia, or circadian rhythm disturbance without symptoms suggestive of an organic sleep disorder were triaged only to the Behavioral Sleep Medicine Clinic (BSMC). All primary caregivers and each patient ≥ 11 years of age completed pre-evaluation screening measures as part of routine clinical care. The comprehensive sleep evaluation conducted by the psychologist or a psychology trainee under direct supervision included

a clinical interview, review of sleep diary (when available), and integration of data with pre-evaluation measures.

All study procedures were approved by the hospital's institutional review board (IRB). Specifically, eligible families received print and verbal information explaining that the purpose of the study was to archive de-identified clinical information for clinical research. Primary caregivers provided written informed consent before being enrolled in the study. Inclusion criteria were ages 6–18 years and completion of diagnostic sleep evaluation. All participants were seen between June 2009 and August 2013. During the enrollment period, 394 patients were eligible for participation. One parent did not provide consent and 10 participants had incomplete CBCL data resulting in the final sample of 383 subjects (97% of eligible subjects) described above.

2.3. Measures

2.3.1. Child behavior checklist

The CBCL [1] is a parent-report measure for assessing global behavioral functioning in children. The measure consists of 119 items rated on a three-point scale (“not true,” “somewhat/sometimes true,” “very true/often true”), with higher scores indicative of more problems. The reliability and validity of the CBCL has been extensively documented [1,16,17]. As described above, although a validated CBCL sleep scale does not exist, seven of the CBCL items pertain to sleep. These seven items were evaluated in the present study, in addition to the social problems, attention problems, internalizing problems, and externalizing problems scales that were used to examine external validity.

2.3.2. Children's sleep habits questionnaire

The Children's Sleep Habits Questionnaire (CSHQ) is a 33-item parent-report measure of sleep behavior and sleep disorders symptoms [18]. Caregivers use a three-point scale to rate the frequency of specific sleep symptoms/behaviors during the previous week (“rarely” to “usually”). The measure yields a total score and eight subscale scores for which higher scores represent more problematic sleep. The CSHQ has demonstrated the validity for use with preschool- and school-aged children and has been shown to differentiate clinical from control groups [18,19].

2.3.3. Sleep disorders inventory for students

The Sleep Disorders Inventory for Students (SDIS) [20] is a parent-report measure screening for sleep disorders that have an organic basis. The SDIS yields a total score and five sleep disorder scales: obstructive sleep apnea, excessive daytime sleepiness, narcolepsy, periodic limb movement disorder, and delayed sleep phase syndrome. Items are rated on a seven-point scale (1 = *the child never exhibits this behavior*; 3 = *child exhibits the behavior 3-to-4 times per month*; 5 = *child exhibits this behavior on a daily basis*; and 7 = *child exhibits behavior multiple times per hour daily or nightly*). Higher scores are indicative of worse sleep problems. Two versions of the form are available. The SDIS-Child version has 41 items and is used with children 2–10 years old (the SDIS-Child does not include the narcolepsy scale); the SDIS-Adolescent version has 46 items and is used with children 11–18 years old.

2.3.4. Adolescent sleep-wake scale

The Adolescent Sleep-Wake Scale (ASWS) is a 33-item youth-report measure that assesses sleep quality in adolescents [21]. Respondents report the frequency of sleep behaviors during the past month using a six-point scale (“always” to “never”). Sleep is measured along five behavioral dimensions. The mean subscale scores and a full-scale sleep quality score are computed. Scores range from 1 to 6, with higher scores indicating better sleep quality. Psychometrics for the ASWS demonstrate adequate reliability for the

subscales (α s = 0.60–0.82) and full scale (α s = 0.80–0.86) as well as concurrent validity through associations with the Adolescent Sleep Hygiene Scale [21].

2.4. Data analytic plan

The seven individual CBCL sleep items were evaluated first. After providing descriptive statistics and the frequency of parents rating each of these items as being “very true or often true,” convergent and discriminant validity was evaluated by examining correlations of the individual CBCL sleep items with validated measures of child and adolescent sleep functioning (described above). Correlations with sleep disorder diagnoses were also examined. Next, a seven-item CBCL sleep composite was examined for convergent validity (with the “total” scores of other sleep measures) and external validity (with the CBCL Social Problems, Attention Problems, Externalizing Problems, and Internalizing Problems scales). A correlation of 0.10 is considered a small effect, a correlation of 0.30 is considered a medium effect, and a correlation of 0.50 is considered a large effect [22].

A CBCL sleep composite score was created by summing the seven sleep-related items on the CBCL. Of note, the CBCL sleep composite score showed very low internal consistency (Cronbach's α = 0.28), likely due to the presence of contradictory items (eg, “sleeps less than most kids” and “sleeps more than most kids”) that are included in this composite and some sleep problems may be present while others are absent (eg, many participants do not “wet the bed,” “talk or walk in sleep,” or have “nightmares” even though they generally have “trouble sleeping”). We nonetheless calculated a CBCL sleep composite score given that this is consistent with prior research and a total score may still meaningfully relate to other validated sleep measures that also tap multiple (and at times unrelated) domains of sleep functioning.

3. Results

3.1. Examination of the individual CBCL sleep items

3.1.1. Descriptive statistics and frequencies

Table 1 presents descriptive statistics and frequencies of the seven CBCL sleep items. As shown, and consistent with expectations for a sleep-referred sample, most parents (85%) endorsed the CBCL “trouble sleeping” item as being “very true or often true” for their child. Half of the participants endorsed the CBCL “sleeps less than most kids” item as being very true or often true. Between 14% and 19% of parents endorsed the items “sleeps more than most kids,” “nightmares,” “talks or walks in sleep,” and “overtired without good reason” as occurring very often. Only 7% of parents endorsed the “wets bed” item as being very true or often true.

3.2. Convergent and discriminant validity

3.2.1. CSHQ

Bivariate correlations of the individual CBCL sleep items with the CSHQ sleep problem subscales and total score are displayed in Table 2. As expected, the CBCL “nightmares” and “talks or walks in sleep” items were significantly and most strongly correlated (large effect sizes) with the CSHQ parasomnia scale (r s = 0.46 and 0.54, respectively). The “nightmares” item was also significantly associated with the CSHQ bedtime resistance and sleep anxiety scales. Moreover, as expected, the CBCL “overtired without good reason” and “sleeps more than most kids” items were significantly and most strongly correlated (medium effect sizes) with the CSHQ daytime sleepiness scale (r s = 0.33 and 0.31, respectively) and were not significantly related to the CSHQ sleep onset, sleep duration, sleep anxiety, or night wakings scales. The CBCL “sleeps less than most

Table 1
Descriptive Statistics and Frequencies of CBCL Sleep Items and Composite.

Variable	<i>M</i> ± <i>SD</i>	Range	Frequency of Item Endorsement		
			Not True (0)	Somewhat or Sometimes True (1)	Very True or Often True (2)
47. Nightmares	0.68 ± 0.73	0–2	184 (48%)	138 (36%)	61 (16%)
54. Overtired w/o good reason	0.58 ± 0.79	0–2	233 (61%)	78 (20%)	72 (19%)
76. Sleeps less than most kids	1.17 ± 0.89	0–2	123 (32%)	70 (18%)	190 (50%)
77. Sleeps more than most kids	0.40 ± 0.72	0–2	283 (74%)	46 (12%)	54 (14%)
92. Talks/walks in sleep	0.65 ± 0.75	0–2	199 (52%)	119 (31%)	65 (17%)
100. Trouble sleeping	1.80 ± 0.51	0–2	19 (5%)	40 (10%)	324 (85%)
108. Wets bed	0.28 ± 0.59	0–2	305 (80%)	50 (13%)	28 (7%)
Sleep Composite	5.56 ± 2.06	0–12	–	–	–

Note. *N* = 383.

kids” item was strongly correlated (large effect size) with the CSHQ sleep duration domain ($r = 0.69$) and moderately correlated (medium-to-large effect size) with the CSHQ sleep-onset scale ($r = 0.39$), and the CBCL “trouble sleeping” item was also most strongly associated (medium effect size) with the CSHQ sleep duration scale ($r = 0.25$). Finally, the CBCL “wets bed” item was significantly correlated (small-to-medium effect size) with the CSHQ parasomnia scale ($r = 0.21$) and nonsignificantly associated with the other CSHQ scales. None of the CBCL sleep items were significantly correlated with the CSHQ sleep-disordered breathing scale, which is not surprising as the CBCL items do not query symptoms of sleep-disordered breathing (e.g., snoring, pauses in breathing during sleep, and gasping for breath).

3.2.2. SDIS

Bivariate correlations of the individual CBCL sleep items with the SDIS-C and SDIS-A dimensions are displayed in Table 3. As expected, the CBCL “overtired without good reason” and “sleeps more than most kids” items were significantly and most strongly correlated with the excessive daytime sleepiness scale on both the SDIS-C ($r_s = 0.37$ and 0.39 , respectively) and the SDIS-A ($r_s = 0.37$ and 0.46 , respectively), with each of these correlations being in the medium-to-large effect size range. These items, as well as the “nightmares” item, were also significantly positively correlated with the SDIS-A narcolepsy scale (the SDIS-C does not include the narcolepsy scale). The CBCL “sleeps less than most kids” and “trouble sleeping” items were most strongly correlated with the SDIS-C and SDIS-A delayed sleep phase syndrome scale, with the exception of the “sleep less than most kids” item not being significantly associated with the delayed sleep phase syndrome scale of the SDIS-A. As expected, none of the CBCL sleep items were moderately or strongly associated with the SDIS obstructive sleep apnea or the periodic limb movement disorder (PLMD) scales, with the exception of the CBCL

“nightmares” item evincing a strong correlation with the PLMD scale on the SDIS-A (but not the SDIS-C).

3.2.3. ASWS

Bivariate correlations of the individual CBCL sleep items with the ASWS scales are displayed in Table 4. Again, as expected, the CBCL “overtired without good reason” and “sleeps more than most kids” items were significantly and most strongly correlated (small-to-medium effect sizes) with the ASWS return to wakefulness scale ($r_s = -0.27$ and -0.20 , respectively) and were not significantly associated with the other ASWS scales. In addition, the CBCL “sleeps less than most kids” and “trouble sleeping” items were most strongly correlated (medium effect sizes) with the ASWS falling asleep scale. The CBCL “talks or walks in sleep” item was significantly and most strongly correlated (small-to-medium effect size) with the ASWS maintaining sleep scale. The CBCL “wets bed” item was not moderately or strongly correlated with any of the ASWS scales. Thus, most of the parent-report CBCL sleep items demonstrated convergent and discriminant validity with the youth-reported ASWS, an important cross-rater validation of the CBCL sleep items.

3.2.4. Sleep disorder diagnoses

Point biserial correlations of the individual CBCL sleep items, as well as the total scores of the CBCL sleep scale, CSHQ, SDIS, and ASWS, with participants’ sleep disorder diagnoses are displayed in Table 5. In terms of the individual CBCL sleep items, and as hypothesized, the CBCL “nightmares” and “talks or walks in sleep” items were significantly and most strongly associated (medium-to-large effect sizes) with a parasomnia sleep disorder diagnosis ($r_s = 0.46$ and 0.43 , respectively). The CBCL “overtired without good reason” item was significantly positively associated with having a psychological insomnia diagnosis and significantly negatively associated with a behavioral insomnia diagnosis ($r_s = 0.20$ and -0.23 ,

Table 2
Correlations of CBCL Sleep Items and Composite with Children’s Sleep Habits Questionnaire (CSHQ) Scores.

Variable	Bedtime Resist.	Sleep Onset	Sleep Duration	Sleep Anxiety	Night Wakings	Parasomnias	Sleep disord. Breathing	Daytime Sleepiness	CSHQ Total
47. Nightmares	0.22**	0.03	0.001	0.28***	0.11	0.46***	0.11	0.17*	0.36***
54. Overtired w/o good reason	0.04	−0.07	−0.03	0.03	−0.01	0.17*	0.08	0.33***	0.22**
76. Sleeps less than most kids	0.15*	0.39***	0.69***	0.06	0.07	0.04	0.02	0.02	0.30***
77. Sleeps more than most kids	0.15*	−0.11	−0.09	0.13	0.07	0.16*	0.05	0.31***	0.24***
92. Talks/walks in sleep	0.02	−0.09	−0.07	0.03	0.05	0.54***	0.04	0.16*	0.23**
100. Trouble sleeping	0.11	0.16*	0.25***	0.08	0.14*	0.13	0.05	0.04	0.21**
108. Wets bed	0.04	0.01	0.11	0.04	0.02	0.21**	−0.03	0.02	0.12
Sleep Composite	0.24***	0.13	0.33***	0.21**	0.14*	0.57***	0.10	0.33***	0.55***

Note. *N* = 211–213. * $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 3

Correlations of CBCL Sleep Items and Composite with Sleep Disorders Inventory for Students (SDIS) Scores.

Variable	Obstructive Sleep Apnea	Periodic Limb Movement Disorder	Delayed Sleep Phase Syndrome	Excessive Daytime Sleepiness	Narcolepsy	Sleep Disturbance Index
SDIS-C (ages 6–10) ^a						
47. Nightmares	0.22**	0.22**	0.04	0.15*	–	0.20**
54. Overtired w/o good reason	0.17*	0.24***	–0.07	0.37***	–	0.23**
76. Sleeps less than most kids	0.11	0.21**	0.38***	0.05	–	0.24**
77. Sleeps more than most kids	0.12	0.13	–0.03	0.39***	–	0.20**
92. Talks/walks in sleep	0.19**	0.21**	–0.04	0.10	–	0.11
100. Trouble sleeping	0.10	0.17*	0.19**	0.07	–	0.16*
108. Wets bed	0.02	0.05	0.03	0.004	–	0.06
Sleep Composite	0.31***	0.41***	0.19**	0.35***	–	0.39***
SDIS-A (ages 11–18) ^b						
47. Nightmares	0.19*	0.48***	0.01	0.22**	0.40***	0.29***
54. Overtired w/o good reason	0.22**	0.15*	0.03	0.37***	0.35***	0.27***
76. Sleeps less than most kids	–0.01	0.19*	0.15	–0.04	–0.05	0.08
77. Sleeps more than most kids	0.15	0.08	0.18*	0.46***	0.41***	0.31***
92. Talks/walks in sleep	0.17*	0.23**	–0.20**	–0.08	0.07	0.04
100. Trouble sleeping	0.03	0.23**	0.27***	0.11	0.10	0.19*
108. Wets bed	0.22**	0.17*	0.03	0.06	0.09	0.15
Sleep Composite	0.32***	0.51***	0.16*	0.42***	0.50***	0.47***

Note. * $p < 0.05$.** $p < 0.01$.*** $p < 0.001$.^a $N = 213$.^b $N = 169$.

respectively), with both of these associations evincing a small-to-medium effect size. The CBCL “sleeps less than most kids” item was significantly negatively associated with having a hypersomnia disorder (small-to-medium effect size), whereas the CBCL “sleeps more than most kids” item was significantly positively associated with having a hypersomnia disorder (small-to-medium effect size). The CBCL “trouble sleeping” item was significantly positively associated with being diagnosed with psychophysiological insomnia and negatively associated with being diagnosed with a hypersomnia ($r_s = 0.19$ and -0.18 , respectively), both evincing a small-to-medium effect size. Finally, the CBCL “wets bed” item was most strongly associated (medium-to-strong effect size) with having a diagnosis of nocturnal enuresis ($r = 0.44$).

Of note, with only a few exceptions, none of the composite scores on the CBCL, CSHQ, SDIS, or ASWS were significantly associated with sleep disorder diagnosis. Even when significant associations did emerge, they were smaller in magnitude than the correlations of the individual CBCL sleep items with sleep disorder diagnoses. The sole exception was the CSHQ evidencing a similar association as the CBCL “overtired,” “sleeps more than most kids,” and “wets bed” items with having a behavioral insomnia diagnosis. Nonetheless, the overall findings examining sleep disorder diagnoses indicate that the individual CBCL sleep items are more strongly associated with specific

sleep disorder diagnoses than the CBCL sleep composite score or total scores from other measures of sleep functioning.

3.3. Examination of the CBCL sleep composite score

3.3.1. Convergent validity

As shown in Tables 2–4, this CBCL sleep composite is significantly and moderately-to-strongly correlated with the CSHQ total score ($r = 0.55$), the ASWS total score ($r = -0.39$), and the Sleep Disturbance Index of the SDIS-C ($r = 0.39$) and the SDIS-A ($r = 0.47$; all $p_s < 0.001$). Moreover, the CBCL sleep composite was more strongly correlated with the CSHQ total score and the SDIS Sleep Disturbance Indexes than any of the individual CBCL sleep items in relation to these scale scores. For example, the CBCL sleep composite was correlated 0.55 with the CSHQ total score (a large effect size), whereas the correlations between the individual CBCL sleep items and the CSHQ total score ranged from 0.12 to 0.36 (small-to-medium effect sizes). Similarly, the CBCL sleep composite was correlated 0.39 with the SDIS-C Sleep Disturbance Index (a medium-to-large effect size), in comparison to correlations ranging from 0.06 to 0.24 for the individual CBCL sleep items with the SDIS-C Sleep Disturbance Index (small-to-medium effect sizes). A similar pattern was found for the SDIS-A Sleep Disturbance Index (see Table 3). Thus, the CBCL sleep

Table 4

Correlations of CBCL Sleep Items and Composite with Adolescent Sleep-Wake Scale (ASWS) Scores.

Variable	Going to Bed	Falling Asleep	Maintaining Sleep	Reinitiating Sleep	Return to Wakefulness	ASWS Total
47. Nightmares	–0.06	–0.02	–0.22**	–0.28***	–0.07	–0.20*
54. Overtired w/o good reason	–0.08	–0.06	–0.12	0.02	–0.27***	–0.15*
76. Sleeps less than most kids	–0.16*	–0.31***	–0.22**	–0.15*	–0.01	–0.26**
77. Sleeps more than most kids	–0.06	0.09	0.11	0.05	–0.20**	–0.01
92. Talks/walks in sleep	–0.01	0.05	–0.24**	–0.14	0.17*	–0.06
100. Trouble sleeping	–0.12	–0.39***	–0.24**	–0.28***	–0.20**	–0.36***
108. Wets bed	–0.16*	–0.16*	–0.13	–0.07	0.05	–0.14
Sleep Composite	–0.21**	–0.25**	–0.34***	–0.26**	–0.21**	–0.39***

Note. $N = 169$. * $p < 0.05$.** $p < 0.01$.*** $p < 0.001$.

Table 5

Point Biserial Correlations of CBCL Sleep Items/Composite and Sleep Scale Scores with Sleep Disorder Diagnoses.

Variable	Behavioral Insomnia	Hypersomnia	Parasomnia	Psychophysiological Insomnia	Delayed Sleep Phase Syndrome	Nocturnal Enuresis
CBCL						
47. Nightmares	0.13*	0.01	0.46***	−0.14**	−0.14**	0.05
54. Overtired w/o good reason	−0.23***	0.07	−0.01	0.20***	−0.004	−0.09
76. Sleeps less than most kids	0.09	−0.21***	−0.12*	0.10	−0.02	0.04
77. Sleeps more than most kids	−0.21***	0.21***	−0.06	0.07	0.09	−0.06
92. Talks/walks in sleep	0.17**	0.02	0.43***	−0.23***	−0.11*	0.11*
100. Trouble sleeping	−0.05	−0.18*	−0.04	0.19***	0.04	−0.05
108. Wets bed	0.27***	−0.001	0.13**	−0.23***	−0.08	0.44***
CBCL Sleep Composite	0.05	−0.02	0.27***	−0.01	−0.08	0.13*
CSHQ Total Score	0.22**	0.15*	0.18*	−0.11	−0.06	0.08
SDIS-C Sleep Disturbance Index	0.06	0.14*	−0.03	−0.06	−0.002	0.07
SDIS-A Sleep Disturbance Index	−0.09	−0.01	−0.08	0.03	0.10	0.05
ASWS Total Score	−0.06	0.09	−0.11	−0.04	0.02	−0.10

Note. ASWS = Adolescent Sleep-Wake Scale. CBCL = Child Behavior Checklist. CSHQ = Children's Sleep Habits Questionnaire. SDIS = Sleep Disorders Inventory for Students (C = child, ages 6–10; A = adolescents, ages 11–18). Rhythmic Movement Disorder was not examined as only four participants met the criteria for this disorder. For all sleep disorder diagnoses, 0 = disorder diagnosis not present, 1 = disorder diagnosis present.

* $p < 0.05$.** $p < 0.01$.*** $p < 0.001$.

composite score showed initial convergent validity with other established parent-reported sleep measures in this sleep-referred sample.

3.3.2. External validity

As the CBCL sleep composite consists of a range of sleep-related behaviors, we compared correlations of the CBCL sleep composite with the CSHQ total score (which also includes a range of sleep-related problems) in relation to the CBCL Social Problems, Attention Problems, Internalizing Problems, and Externalizing Problems scales. The individual CBCL sleep items were also included in order to compare the CBCL sleep composite and the individual CBCL sleep items in relation to these external correlates. As shown in Table 6, the CBCL sleep composite evinced very similar correlations to the CSHQ total score with social, attention, internalizing, and externalizing problems. Specifically, the correlation of these two sleep scales had the same correlation with Attention Problems ($r = 0.28$, $p < 0.001$). Although the correlations of the CSHQ total score with the Social, Internalizing, and Externalizing scales ($r_s = 0.36$, 0.54 , and 0.36 , respectively) were somewhat larger than the CBCL sleep composite with these CBCL scales ($r_s = 0.30$, 0.43 , and 0.31 , respectively), Steiger's z -tests for dependent correlations indicated that the strength of the associations did not differ for the Social Problems or Externalizing Problems scales ($z_s = 0.98$ and 0.82 , $ps > 0.05$). The CSHQ total score had a somewhat stronger correlation with the Internalizing

Problems scale than did the CBCL sleep problems scale ($z = 1.99$, $p = 0.047$), likely because the CSHQ scale includes a subscale consisting of items that specifically assess sleep anxiety. In addition, the CBCL sleep composite was consistently more strongly associated than the individual CBCL sleep items with youths' social, attention, internalizing, and externalizing problems.

4. Discussion

The aim of the current study was to examine the correspondence of the sleep items on the frequently used CBCL in relation to validated sleep scale indices and children's sleep disorder diagnoses, thus building on the prior research by Gregory and colleagues [3] examining the utility of the CBCL for identifying sleep problems in clinical samples. Whereas Gregory et al. examined the correlations of four CBCL sleep items with sleep diary, actigraphy, and PSG, we sought to examine the relations of each of the seven individual CBCL sleep items and a sleep composite score with parent and youth report on sleep-specific measures (ie, CSHQ, SDIS, and ASWS) and sleep-specific diagnoses in a large sample of children and adolescents referred to an accredited SDC. In addition, as an initial test of external validity, we examined the individual CBCL sleep items, CBCL sleep composite, and CSHQ total score in relation to youths' attention, internalizing, externalizing, and social problems. Taken together, this study is important in that it provides (1) descriptive data on

Table 6

Correlations of CBCL Sleep Items/Composite and CSHQ Total Score with CBCL Problem and Syndrome Scales.

Variable	Social Problems	Attention Problems	Internalizing Problems	Externalizing Problems
CBCL				
47. Nightmares	0.14*	0.11	0.32***	0.13
54. Overtired w/o good reason	0.16*	0.18**	0.30***	0.20**
76. Sleeps less than most kids	0.16*	0.19**	0.18*	0.22**
77. Sleeps more than most kids	0.21**	0.10	0.17*	0.15*
92. Talks/walks in sleep	0.02	−0.01	0.17*	0.03
100. Trouble sleeping	0.13	0.16*	0.17*	0.16*
108. Wets bed	0.11	0.14*	0.02	0.07
CBCL Sleep Composite	0.30***	0.28***	0.43***	0.31***
CSHQ Total Score	0.36***	0.28***	0.54***	0.36***

Note. $N = 211$. CBCL = Child Behavior Checklist. CSHQ = Children's Sleep Habits Questionnaire.

* $p < 0.05$.** $p < 0.01$.*** $p < 0.001$.

how the CBCL sleep items and sleep composite perform in a sample of sleep-disordered children, (2) evidence of the convergent and discriminant validity of the CBCL sleep items and sleep composite, and (3) preliminary support for the external validity of the CBCL sleep composite.

As expected, many of the individual CBCL sleep items were significantly associated with expected scales on well-validated sleep-specific measures and with related sleep disorder diagnoses. First, the CBCL item “trouble sleeping” and “sleeps less than most kids” correlated most strongly with scales assessing sleep duration (CSHQ), delayed sleep phase (SDIS), and sleep initiation (ASWS), as well as having a diagnosis of psychophysiological insomnia. In addition, as expected, the CBCL sleep items “sleeps more than most” and “overtired without good reason” were most strongly associated with scales measuring daytime sleepiness (SDIS, ASWS), return to wakefulness (ASWS), and narcolepsy (SDIS-A). In addition, the CBCL items “nightmares,” “talks or walks in sleep,” and “wets bed,” which were examined for the first time in this study, were strongly correlated with the CSHQ parasomnias scale. Moreover, “nightmares” was also significantly associated with bedtime resistance (CSHQ), sleep anxiety (CSHQ), periodic limb movement (SDIS), and narcolepsy (SDIS-A), whereas “talks or walks in sleep” was significantly related with maintaining sleep (ASWS). The “wets bed” item was also significantly associated with having a nocturnal enuresis diagnosis.

Interestingly, while the “sleeps more than most kids” and “overtired without good reason” items were both negatively associated with having a behavioral insomnia diagnosis, these two CBCL items differed in their positive associations with other sleep disorder diagnoses: “sleeps more” was positively associated with having a hypersomnia diagnosis whereas “overtired” was positively associated with having a psychophysiological insomnia diagnosis. This differential finding is particularly noteworthy as it demonstrates the ability of the CBCL sleep items to distinguish between tiredness linked to psychophysiological insomnia and sleepiness linked to hypersomnia (or excessive daytime sleepiness), a distinction that has important implications for assessment and treatment [23].

It should be noted that although nearly all of the moderate-to-strong correlations found in this study were consistent with expectations, several expected associations did not emerge. For example, “sleeps less than most kids” was not found to be significantly related to night wakings (CSHQ), daytime sleepiness (SDIS), or return to wakefulness (ASWS), and “sleeps more than most kids” was not found to be related to sleep duration (CSHQ). In addition, “nightmares” was unexpectedly related to periodic limb movements in adolescents (SDIS-A), but not in children (SDIS-C). It may be possible that parents of adolescents who endorse increased symptoms of movement, periods of wakefulness, or sweating during sleep make assumptions about the cause of these symptoms and in turn endorse higher rates of their teenage children having nightmares.

In addition to the individual CBCL sleep items, the CBCL sleep composite was expectedly and significantly related to total scores and all of the subscale scores on the CSHQ, SDIS, and ASWS. Further, the sleep composite was significantly related to social problems, attention problems, internalizing problems, and externalizing problems, and these correlations were of similar magnitude to those between the CSHQ total score and the individual CBCL sleep items with these adjustment domains. It is important to note, however, that the CBCL sleep composite was not generally associated with sleep disorder diagnoses (small-to-moderate correlations were found in relation to parasomnia and enuresis diagnoses), suggesting that the CBCL sleep composite provides a useful snapshot of whether overall sleep problems exist but lacks specificity in terms of predictive validity with sleep diagnoses. The individual CBCL sleep items were more strongly related than the CBCL sleep composite to youths’ sleep disorder diagnoses. In addition, although the CBCL may be helpful in screening for general sleep problems, it does not assess

for symptoms of sleep-disordered breathing or movement disorders such as restless leg syndrome or PLMD. Hence, the CBCL sleep composite is ideally suited for large-scale epidemiological studies or clinical trials that are not focused on sleep per se but nonetheless wish to include a short measure of sleep derived from items on a commonly used measure that assesses other facets of children’s emotional and behavioral functioning.

The strengths of this study include the use of a large sample of children referred to an accredited SDC, which allowed for an examination of how the CBCL sleep items and sleep composite score related to a range of well-validated sleep measures as well as sleep disorder diagnoses. Nonetheless, several limitations should also be noted. First, objective measures of sleep were not utilized. Still, although PSG, actigraphy, and sleep diaries are considered the gold-standard sleep assessment, this study is imperative to the current state of the literature because such methods are typically too intensive and costly for wide-scale use, particularly in epidemiological studies or among clinicians not working in a sleep center. Assessing sleep exclusively using CBCL is far from ideal; however, this measure may be particularly useful in large-scale studies and archival datasets. Second, the generalizability of this study should be considered a limitation. The current sample included children of ages 6–18 years who were referred to an SDC and triaged to a licensed psychologist certified in behavioral sleep medicine. Although we view the use of a clinical sample of sleep-referred children as an overall strength of this study, results may not be generalized to all youths. Future research should use larger samples that are representative of the general population, although it would likely be difficult for such studies to include as many validated sleep-specific measures as this study in tandem with sleep disorder diagnoses. Third, the reporting time period on the CBCL is the past 6 months while the reporting time on the sleep specific measures varies from 1 week to 6–12 months. A clinical interview with families allowed for clarification of inconsistencies across measures and all sleep disorder diagnoses were based on current symptomatology. Finally, with the exception of the adolescent-report data collected on the ASWS, most of the data collected in the study were parent-reported and thus subject to mono-informant biases. No child-reported sleep was collected and as children have an important perspective of their sleep functioning [24,25], future studies should examine child-reported sleep functioning in relation to the CBCL sleep items/composite.

In conclusion, although the CBCL is not a sleep-specific measure and was not originally developed to screen for sleep disorders in youths, the correspondence between the CBCL sleep items and a CBCL sleep composite score with well-validated measures of sleep functioning provides support for use of the CBCL in research studies, as well as a potential screening measure for sleep problems in clinical practice settings when focused sleep screening is not possible.

Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: <http://dx.doi.org/10.1016/j.sleep.2014.09.008>.

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